

Response to DOE CD-1 Review of BTeV

- There were no CD-1 recommendations for the WBS1.1 subproject.
- Nevertheless, as a result of the general CD-1 recommendation to reevaluate the overall BTeV spectrometer installation schedule, a careful reexamination of the schedule for the installation of the WBS1.1 components has resulted in a much larger float, and a better understood schedule, for WBS1.1.

- Develop more conservative schedule with significant more float (> 6 months)
 - We have followed their recommendation. By moving a few procurements forward and move back the detector need-by date, we have achieved a float of about 1 year.
- Evaluating options for relaxing the funding profile constraints to achieve a more conservative approach
 - DONE. We have increased the funding for FY05 to move up the production of sensors and speed up the module development.

- Evaluate schedule and performance impact of staging options
 - While we believe that the experiment will work with an efficiency of about 60% with say $\frac{1}{2}$ of the pixel stations, to complete the installation of the other half of the pixel detector will lead to a long shutdown, estimated to be about 6 months or longer and with considerable risk to the forward tracking stations (which need to be removed first before the pixel vacuum vessel can be taken out). After careful consideration, we think that it's better to assign resources to guarantee the completion of the pixel detector on schedule and not pursue the staging option.

- Recommendations:

- Test prototype detectors in C0 asap to gain experience in a hadron collider
- Measure neutron flux in various locations in C0
- Study compatibility test between C_4F_8O and materials in the vessel

- Response:

- We can take data in C0 with the LR prototype that will be used in the beam test of FY05 and do more extensive background studies
- We have a material compatibility tests under way

- Explore ways to arrive at a schedule with comfortable float (>6 months) by working with BTeV Management and Installation & Integration group.
 - Staged installation of EMCAL is our answer to this recommendation. We now have a minimum of 187 days business days (~ 9 months) of floats for crystals.
- Add an Installation Engineer to the project.
 - There will be an Integration Physicist in the Project Office.
- Add US collaborators
 - Yes, we are trying.

- The primary recommendation was that we hire a full-time quality assurance engineer for the duration of the project.
 - After discussing this with project management, it was decided that additional effort will be added to the project office to handle QA issues for BTeV. The muon project will hire a full-time technician to handle QA and project oversight.
 - We have added this technician to our WBS
- Actively pursue forward funding.
 - Vanderbilt has verbally agreed to provide \$1M in forward funding. MOU is in preparation.

- Select the straw material, straw diameter, and wire diameter within this year. Clear work plan should be provided.
 - We will acquire new Copperized Kapton Straws and subject them to radiation tests. We will also test 30 μm Anode wire (currently use 25 μm wire). We will set up a work plan.
- Put Additional Effort into aging test
 - UH and UVa will test new straw materials (and anodes) and UH, UVa, and SMU have proposal to undertake Rad Damage test at IUCF.
- Produce more prototypes (preferentially in all production sites) and test. They should be built with production components and tooling as much as possible
 - This is consistent with our Station 3 prototype effort
- Move up production schedule by ~6 months
 - DONE
- Strengthen management with a project engineer
 - Production engineer and site managers now added to the org. chart.

➤ From CD-1 Report:

- The silicon strip tracking detector was **found to be in good shape** at the CD-1 review. The positive news about **INFN funding** makes the schedule for the silicon strip tracker **even more robust**.

➤ Indeed all the funding constraints were removed from the schedule and the float went from 112 days up to 247 days.

- **About 1 year delay can be safely absorbed!**

- Re-evaluate the basis of estimate of the FPGA costs to allow for uncertainty in the de-escalation profile.
 - We no longer de-escalate FPGA costs.
- Quickly identify and apply new individuals and groups to provide the physicist effort for by the WBS.
 - We have identified new individuals and groups (Univ. of Houston, Southern Methodist University, Univ. of Virginia), and will continue to do so.
- Develop a schedule which (a) completes critical design and validation activities as soon as possible and is ready for production six to nine months in advance of the production start date, and (b) completes production of the trigger and data acquisition systems six to nine months in advance of first collisions.
 - (a) Critical design and validation activities have been an ongoing effort. We will complete the L1 PP&ST system 8 months before the start of production.
 - (b) We have developed a schedule that completes 50% of the L1 trigger more than 13 months before the need-by date for the Stage 1 detector, and completes 50% of the L2/3 trigger almost one year before the need-by date.

- Develop a schedule which completes critical design and validation activities as soon as possible and is ready for production 6 to 9 months in advance of the production start date.
 - Pixel DCB production has been moved from WBS 1.2 to WBS 1.9. This allows us to begin the design effort for all DCBs in FY05, which is one year earlier than in our previous schedule. We will complete the DCB design 7 months before the start of production.
- Re-evaluate the bases of estimate of the FPGA costs to allow for uncertainty in the de-escalation profile.
 - We no longer de-escalate electronics costs. For some components, we assume a nominal increase in performance between now and the time of purchase.

- Develop schedule with adequate contingency using bottom-up information
 - The uses labor and duration information provided by the sub-systems
 - The sub-systems have also re-evaluated their installation tasks and procedures. Some changes include:
 - Eliminating un-necessary survey
 - Increasing the number of installation fixtures to speed installation
- Using engineering design to decrease the installation duration
 - This is an ongoing process that includes:
 - Developing the cable and utility routing details so that that field fitting is minimized.
 - Evaluating detector design features that can speed installation and servicing.
 - Developing comprehensive CAD models of adjacent detectors to check for spatial conflicts.
- Appoint level 2 physicist for installation and integration
 - BTeV Project Management is actively seeking such a person.
- Increase installation contingency to 75%
 - The contingency is now 65% but the base costs were increased \$1.06M because of additional labor applied before and during the second extended shutdown.

1) Increase AP manpower to work on beam dynamics during preliminary design phase

We concur with this recommendation. An additional accelerator physicist (Tanaji Sen) has been formally assigned to this project. In addition, Meiquin Xiao will continue to provide calculational support for tracking studies.

2) Study failure modes that could damage pixels

We concur with this recommendation. A physicist in the AD Tevatron Department has been formally assigned as liaison to the C0 IR project, and he is leading this study in conjunction with the pixel group and members of the AD Integration Department. A preliminary list of accident scenarios with actual or potential mitigation strategies is published in btev-doc-3430. Calculations are ongoing

3) Determine effect of BTeV pixels on beam dynamics

We concur with this recommendation, but it is properly the responsibility of the pixel group (WBS 1.2), which has already done substantial work on this subject.

4) Assess viability of hanging support system well before relase of vacuum vessel RFP in Feb. 05

We concur with this recommendation. A mockup will be constructed within the next few months, and mechanical tests will be performed. A design for a test stand currently exists, and once it is built it will be stationed at the C0 Assembly Hall (or service building) for long term monitoring of motion

5) Resolve HTS lead issue before CD-2

We concur with this recommendation. We have verified that the HTS leads currently installed in some H spools in the Tevatron will operate at 10KA. We intend to use these 7 lead pairs and will purchase 6 new ones from vendors. Two potential vendors have been identified.

6) Aggressively pursue choice of vendor for correction coils with emphasis on schedule

We concur with this recommendation. We have visited or communicated with several other laboratories. BNL is the only lab that can easily meet our schedule. We are currently writing an MOU with BNL to supply us with the corrector packages.

7) Review preliminary spool design prior to CD-2 if possible

We concur with this recommendation. We submitted the spool design to 6 different vendors for comments and budgetary cost estimates. These vendors were paid for this service. So far we have received credible responses from 3 of these vendors.

- 1.) Define and document boundaries and interfaces with both Integration (1.10) and Interaction Region (2.0) in time for CD-2 Review.
 - Continued participation at Collaboration meetings, BTeV Technical Board meetings and the Project Management Group meetings provide a structured format for maintaining communications between subprojects.
 - Less formal meetings between the three subprojects provide for specific transfer of criteria. Criteria documented in the BTeV database.
 - MOU documenting the "Boundaries / Division of Responsibilities" and "Source of Requirements" is included in the Title I appendix.

- 2.) Involve key procurement personnel and approving official in advance to allow for rapid placement of the large Phase I procurement at project approval (CD-2).
 - Ongoing meetings between procurement, BTeV Project management, and WBS 2.0, WBS 3.0 subproject are held periodically to update status of long lead procurements.
 - Procurement has assembled a list of procurement activities specific for C-0 Outfitting Phase I. This document is included in the Title I Appendix entitled "Recommended Milestones for Solicitation C0 Phase 1 Construction"
 - The importance of continued involvement and updating of the procurement group, while the design continues to develop, is recognized to achieve a prompt contract solicitation and award.